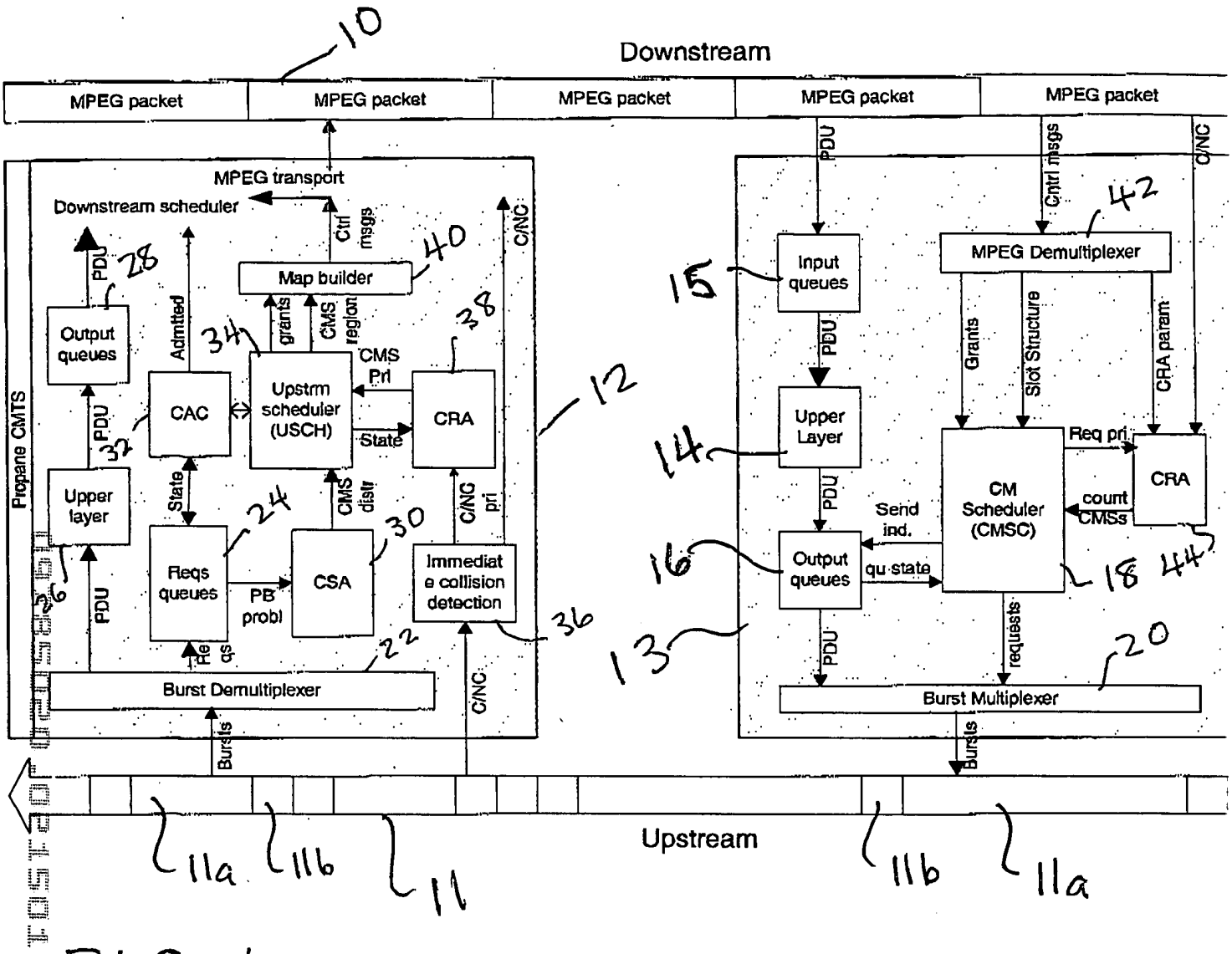
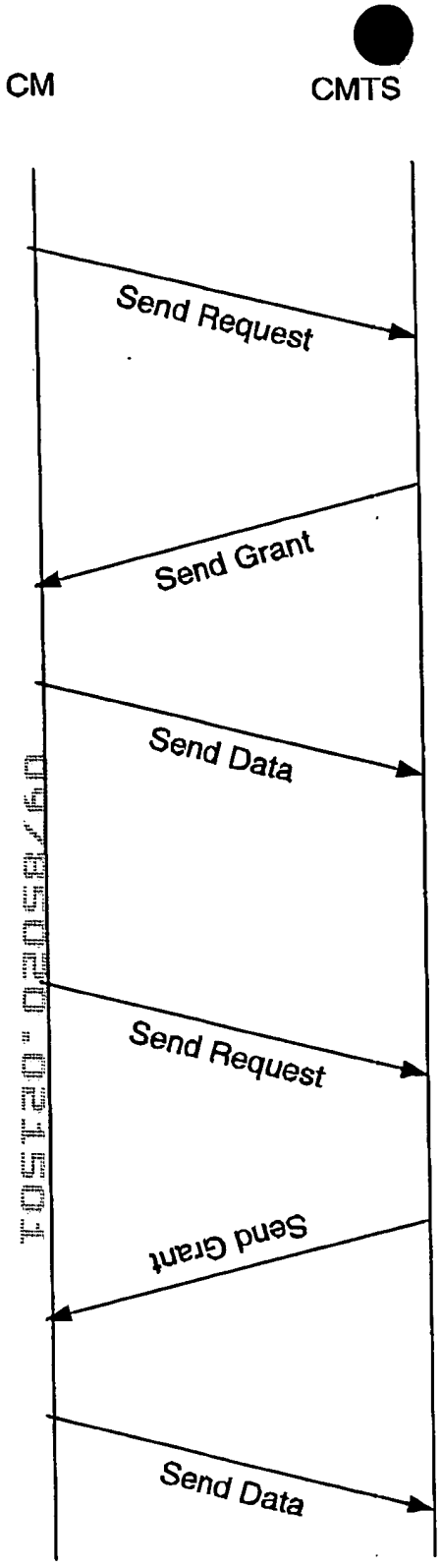
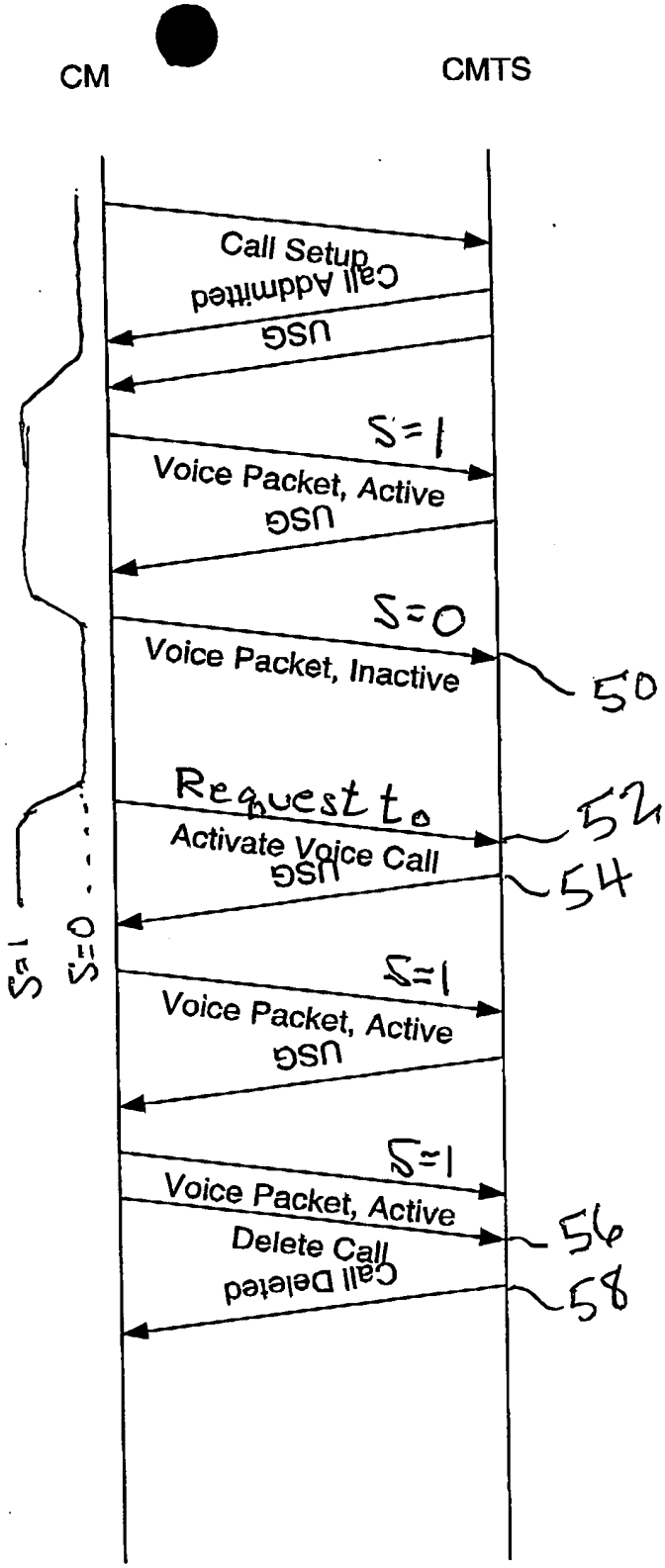

10
Downstream
MPEG packet
MPEG packet
MPEG packet
MPEG packet
MPEG packet
MPEG transport
Downstream scheduler
Ctrl msgs
C/NC
Map builder
40
PDU
28
Output queues
Admitted
34
grants
CMS region
38
CMS Pri
CAC
Upstrm scheduler (USCH)
CRA
State
12
PDU
32
Upper layer
State
24
CMS distr
C/NC pri
Reqs queues
PB probl
CSA
30
Immediate collision detection
36
26
PDU
Reqs
22
Burst Demultiplexer
C/NC
Bursts
Propane CMTS
Input queues
15
PDU
Upper Layer
14
PDU
Send ind.
Output queues
16
qu state
PDU
13
Cntrl msgs
C/NC
42
MPEG Demultiplexer
Grants
Slot Structure
CRA param
Req pri
CM Scheduler (CMSC)
count CMSs
CRA
18
44
requests
20
Burst Multiplexer
Bursts
Upstream
11a
11b
11
11b
11a

FIG. 1



Data Service

FIG. 2A



Voice Service

FIG. 2B

T05T20"02058260

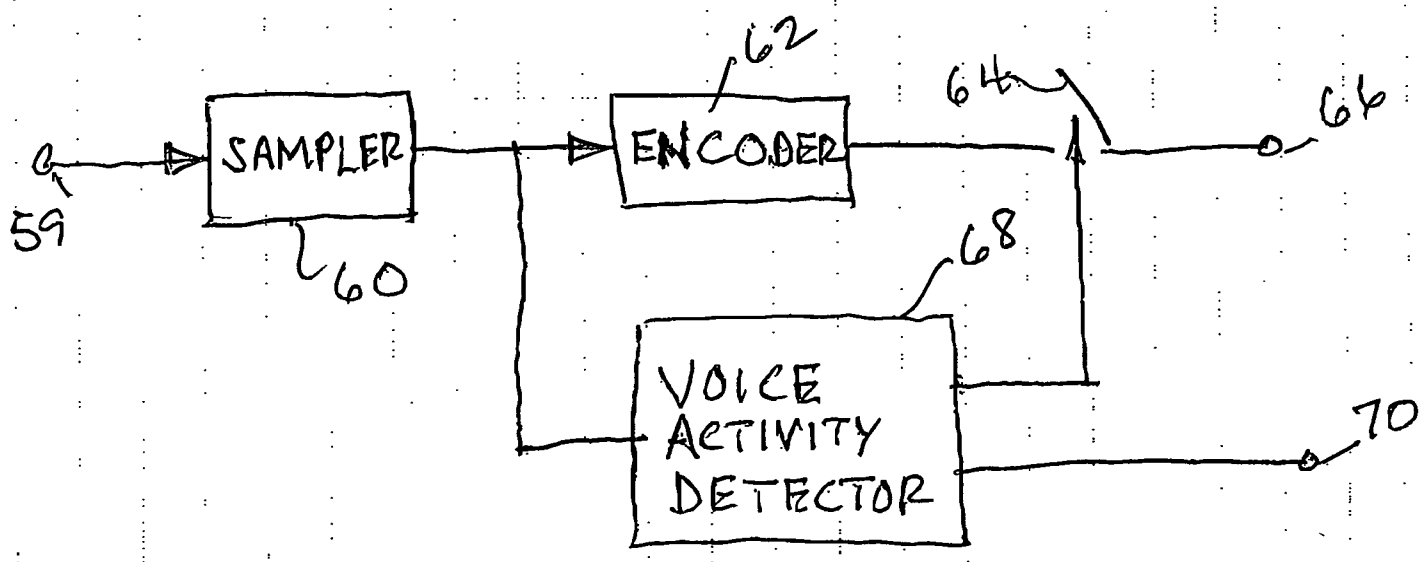


FIG. 3

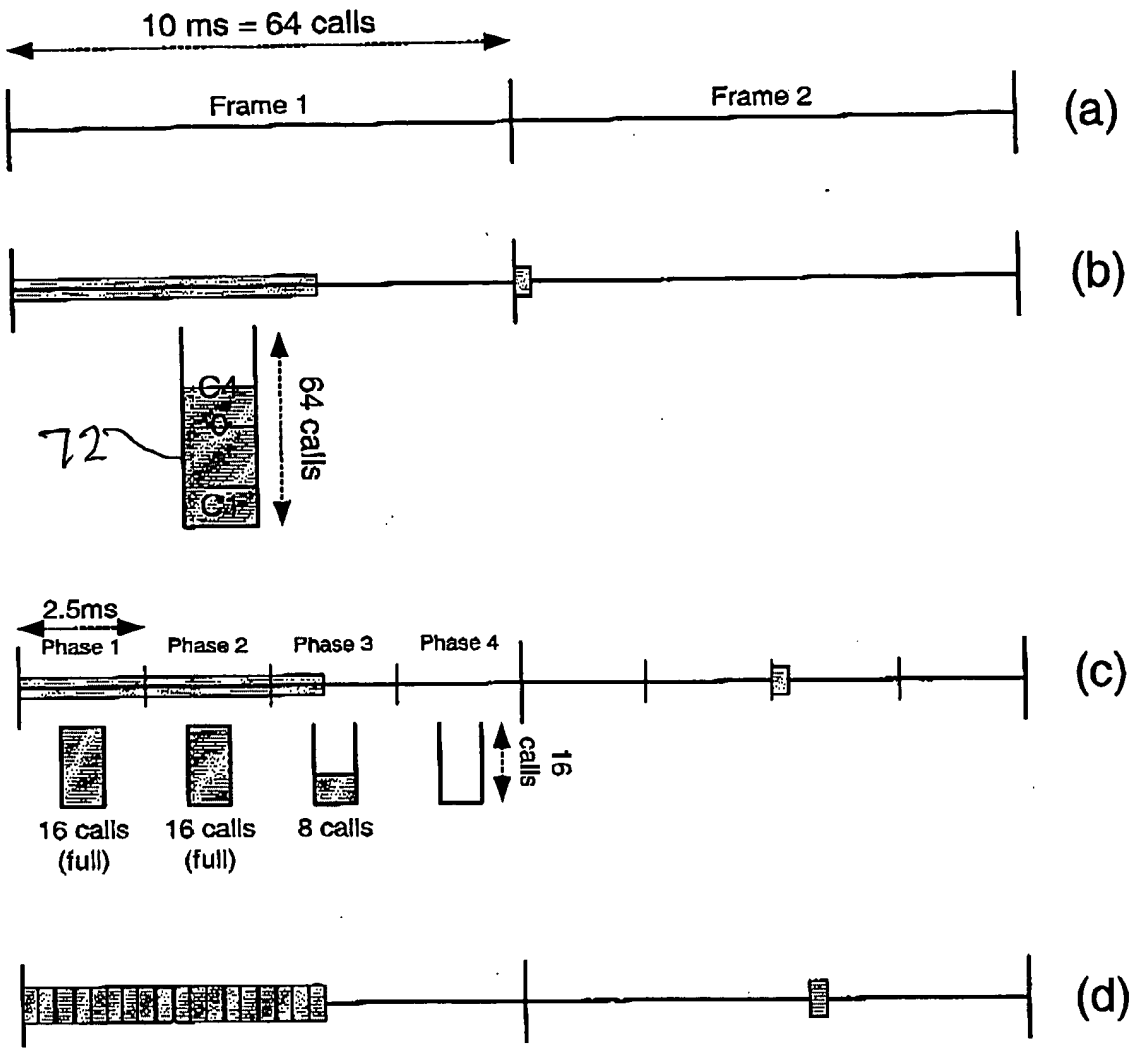
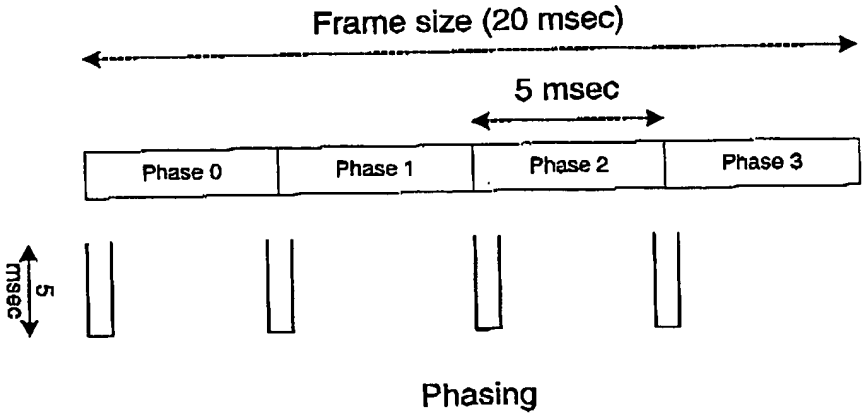

10 ms = 64 calls
Frame 1
Frame 2
(a)
(b)
72
C4
C1
64 calls
2.5ms
Phase 1
Phase 2
Phase 3
Phase 4
16 calls
(full)
16 calls
(full)
8 calls
16 calls
(c)
(d)

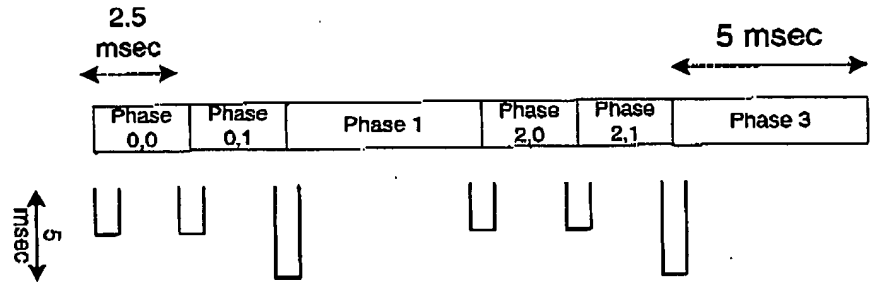
FIG. 4



Voice frame

FIG. 5A

Phasing



Voice frame

FIG. 5B

Sub Phasing

FIG. 5C

Call 1 : CM1, VID0: 5ms, 16 Kbps = 2 MS (1:0)
Call 2 : CM2, VID0: 10ms, 32 Kbps = 4 MS (2:0)
Call 3: CM3, VID0: 20ms, 32 Kbps = 7 MS (3:0)
Call 4: CM4, VID0: 20ms, 32 Kbps = 7 MS (4:0)
Call 5: CM1, VID1: 10ms, 16 Kbps = 3 MS (1:1)
Call 6: CM2, VID1: 10ms, 16 Kbps = 3 MS (2:1)

Doc 1 - 20050250.pdf

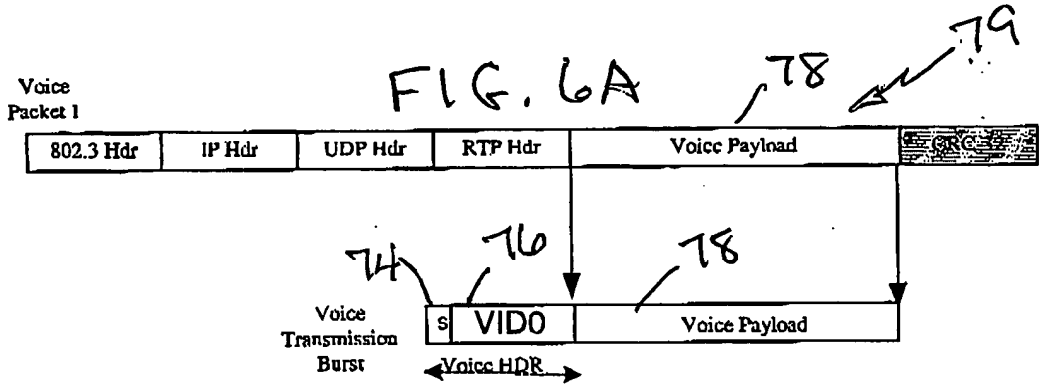


FIG. 6A

Mapping VoIP Packets into Voice PDUs

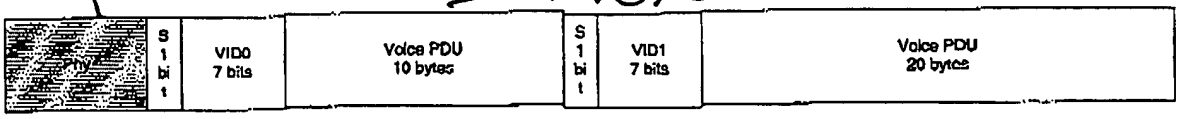


FIG. 6B

Concatenation of two voice channels of different rates

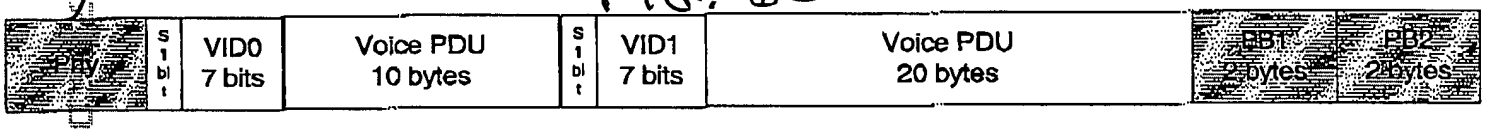


FIG. 6C

Concatenation of voice channels and piggybacking requests

EOS-2002-0052-US

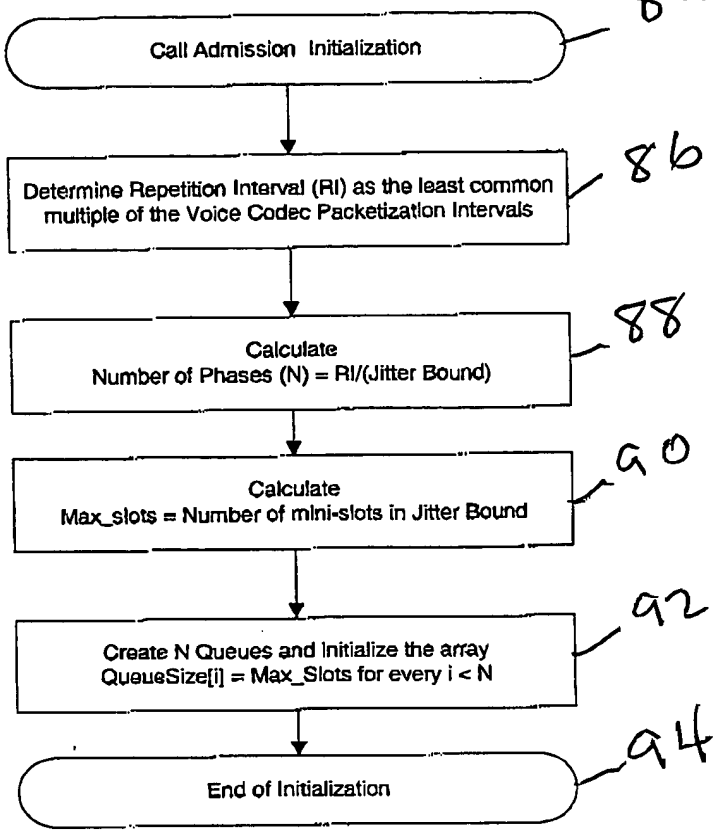


FIG. 7

FOSTER - 0230656.010

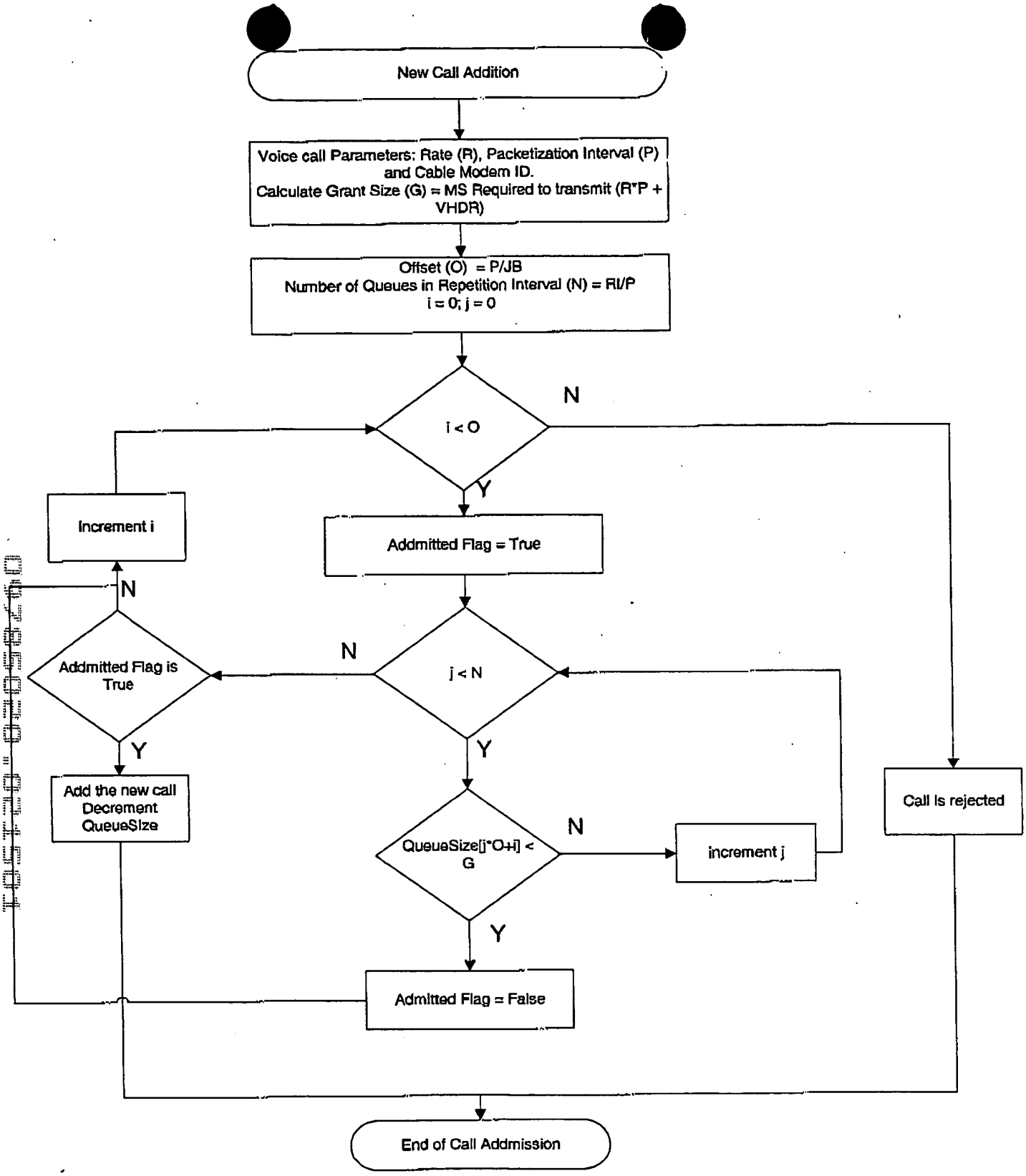
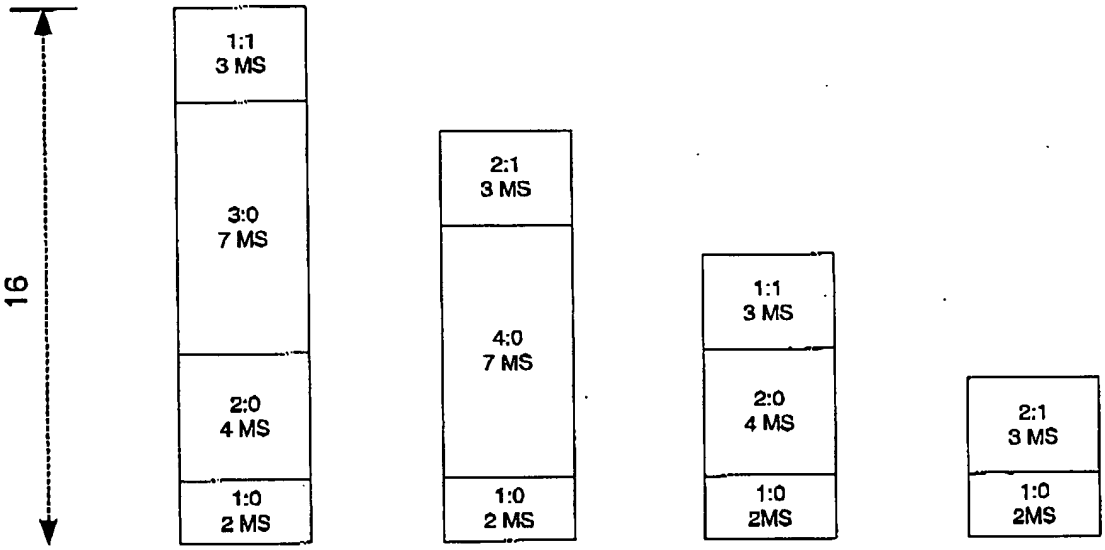

New Call Addition
Voice call Parameters: Rate (R), Packetization Interval (P) and Cable Modem ID.
Calculate Grant Size (G) = MS Required to transmit (R*P + VHDR)
Offset (O) = P/JB
Number of Queues in Repetition Interval (N) = RI/P
i = 0; j = 0
i < O
N
Y
Increment i
Addmitted Flag = True
N
Addmitted Flag is True
N
j < N
Y
Y
Add the new call
Decrement QueueSize
QueueSize[j*O+i] < G
N
increment j
Y
Call is rejected
Admitted Flag = False
End of Call Addmission

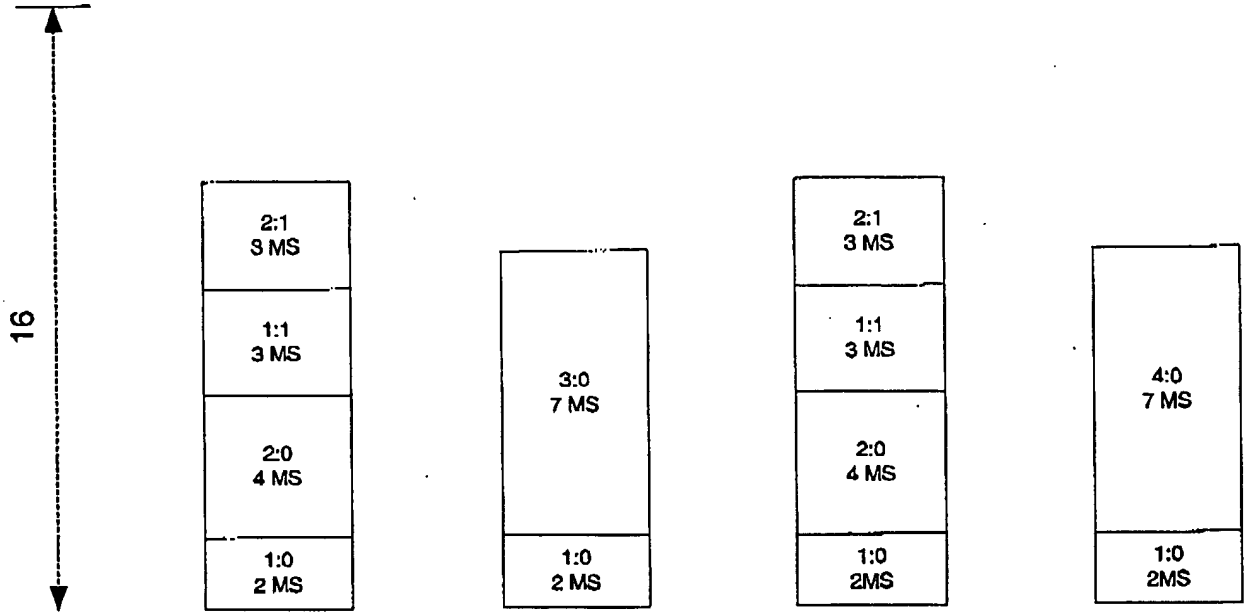
FIG. 8



Call Admission: Unbalanced

FIG. 9

EP 0 952 750 A2

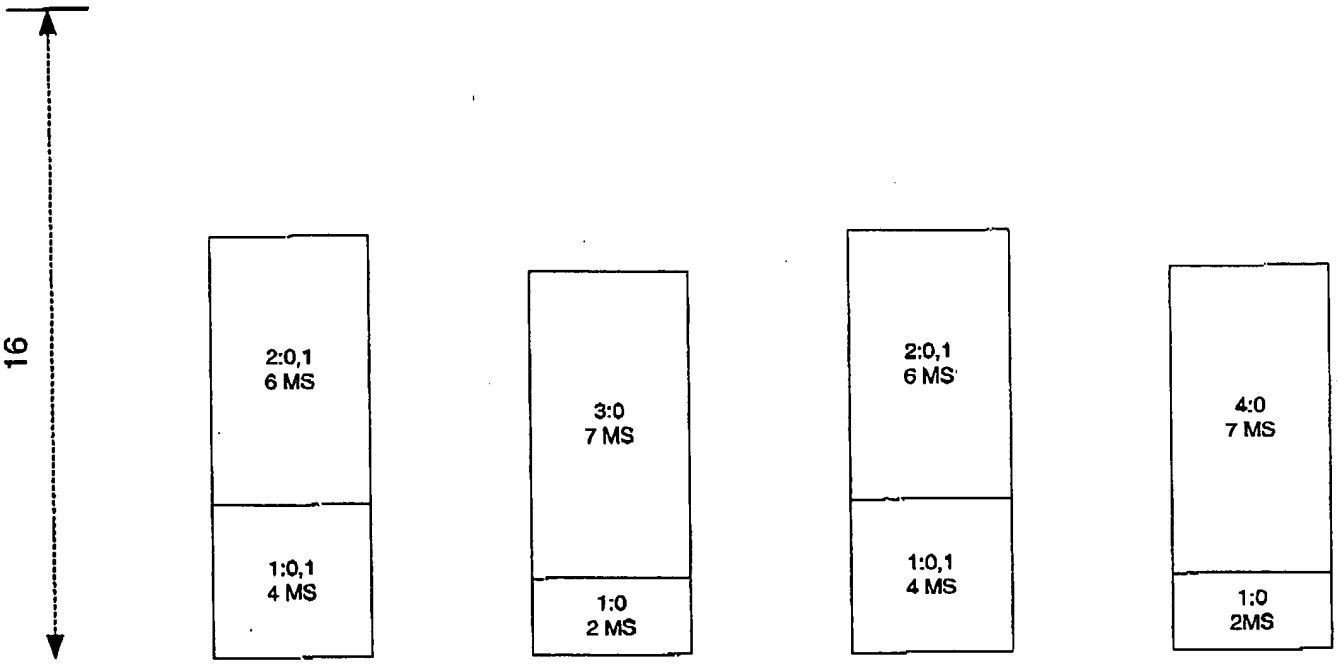


Call Admission: Balanced

FIG. 10

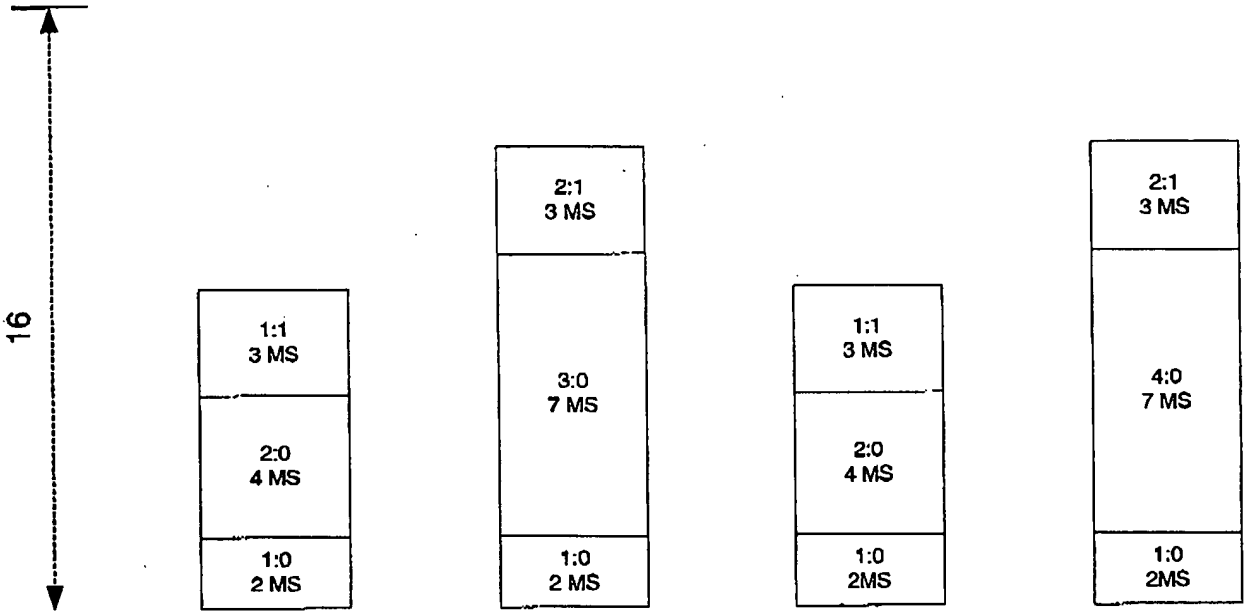
Docket: 0050.0050

EP 0 525 960 A2



Call Admission: Balanced with Concatenation

FIG. 11



Call Admission: Balanced and Distributed CM Allocation

FIG. 12

EXPRESS MAIL NO. EV339020956US

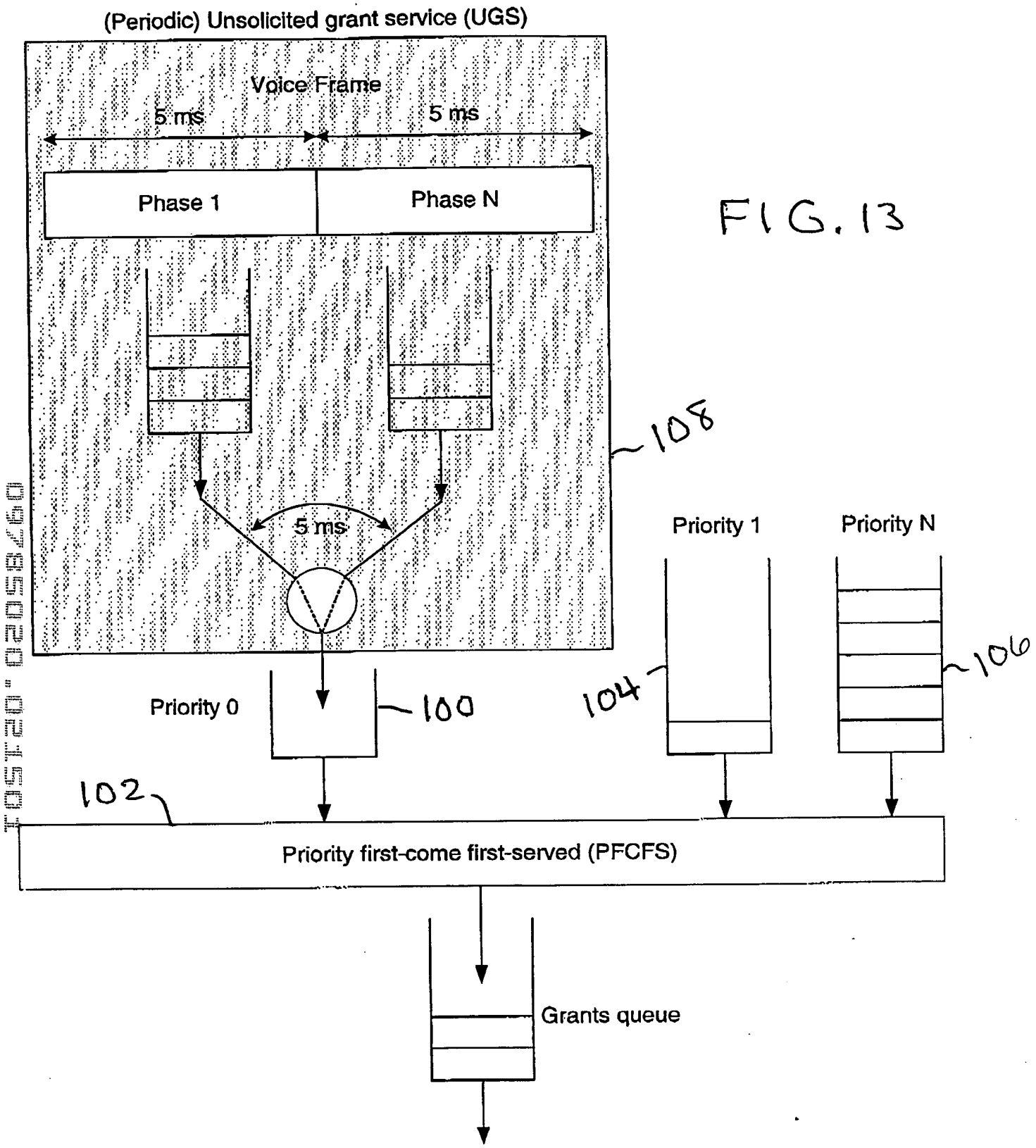

(Periodic) Unsolicited grant service (UGS)
Voice Frame
5 ms
5 ms
Phase 1
Phase N
5 ms
108
Priority 1
Priority N
Priority 0
100
104
106
102
Priority first-come first-served (PFCFS)
Grants queue

FIG. 13

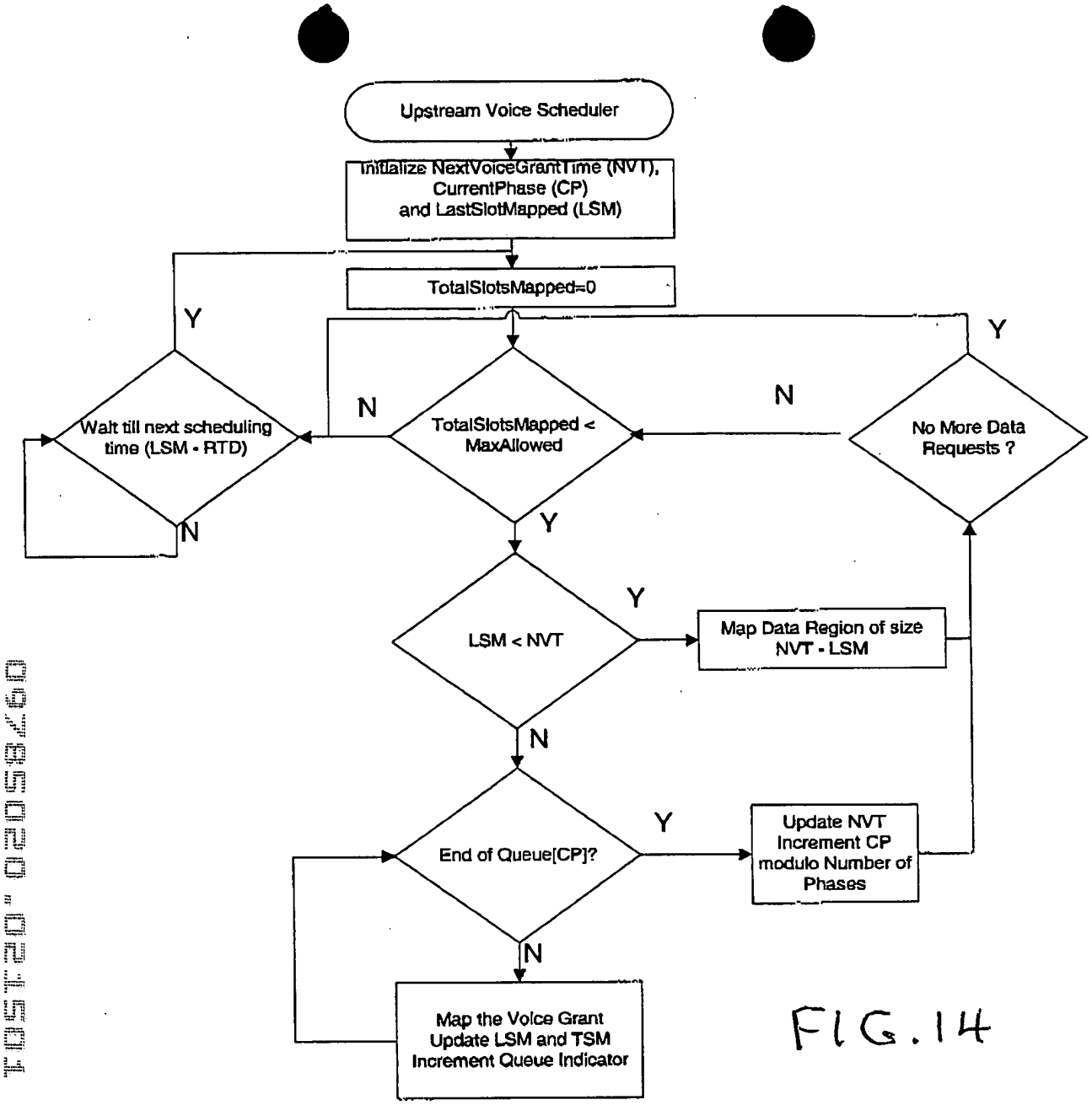
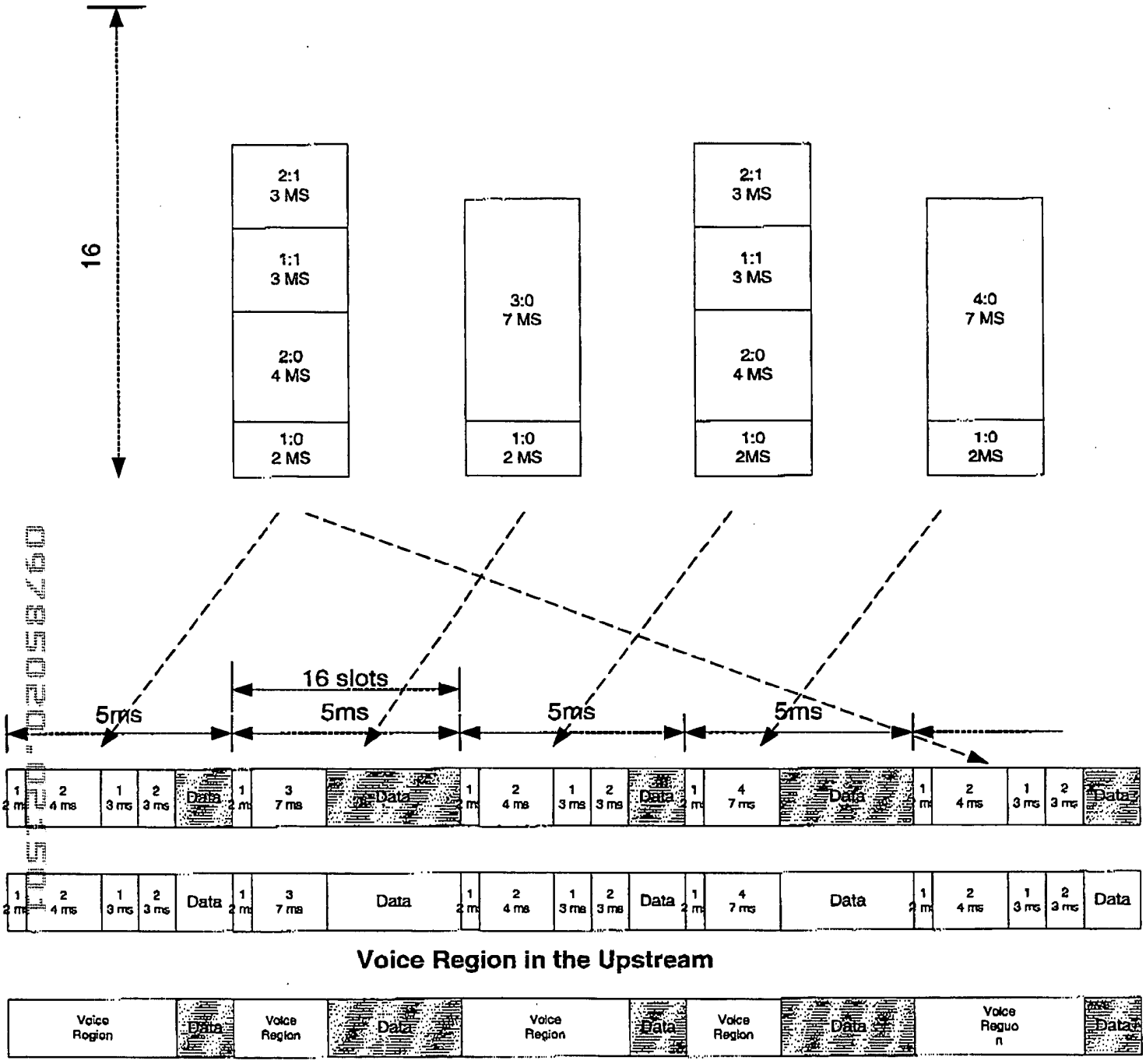


FIG. 14

EXPRESS MAIL NO. EV 350 820 720 US



Voice Scheduling : Mapping Voice State into Upstream Grants

FIG. 15

TOSTZO" 02058260

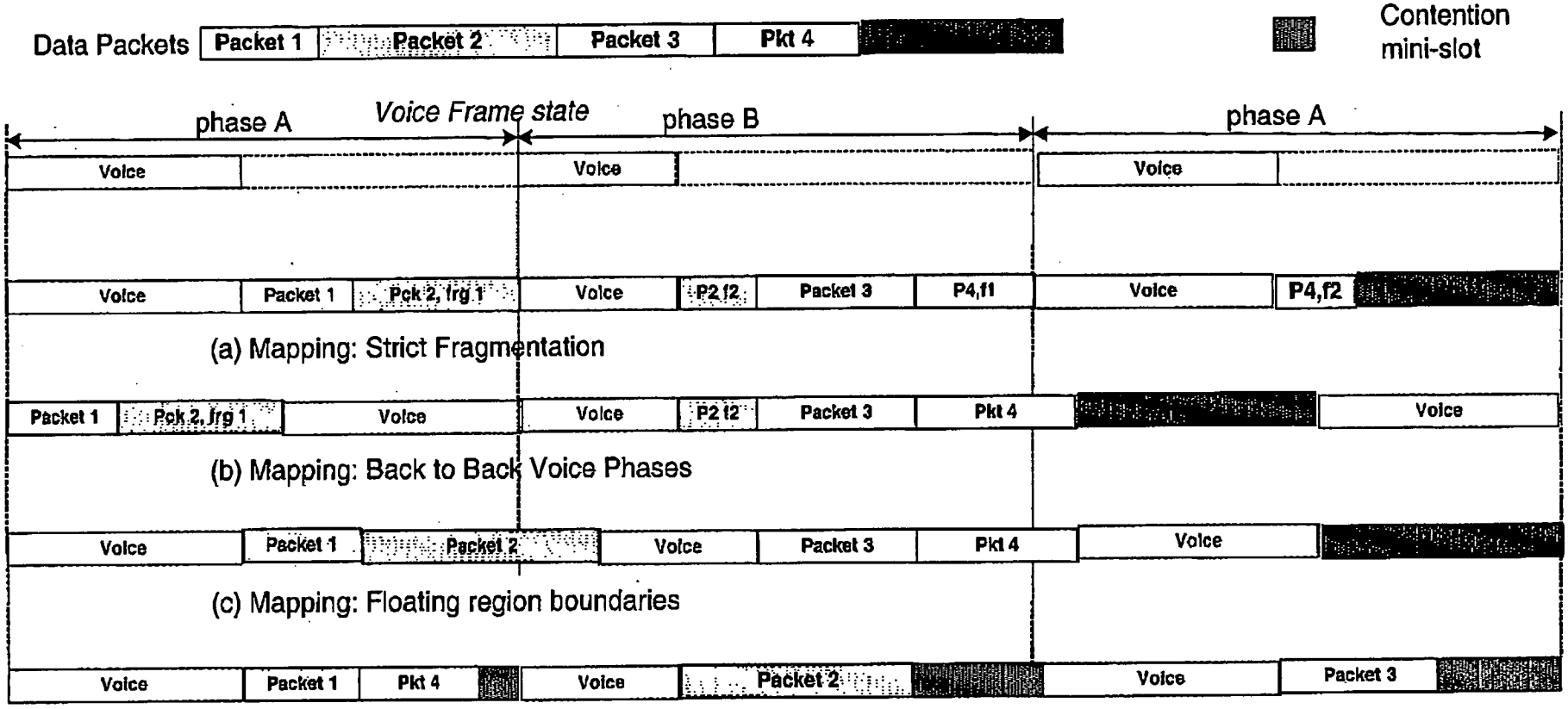


FIG. 16

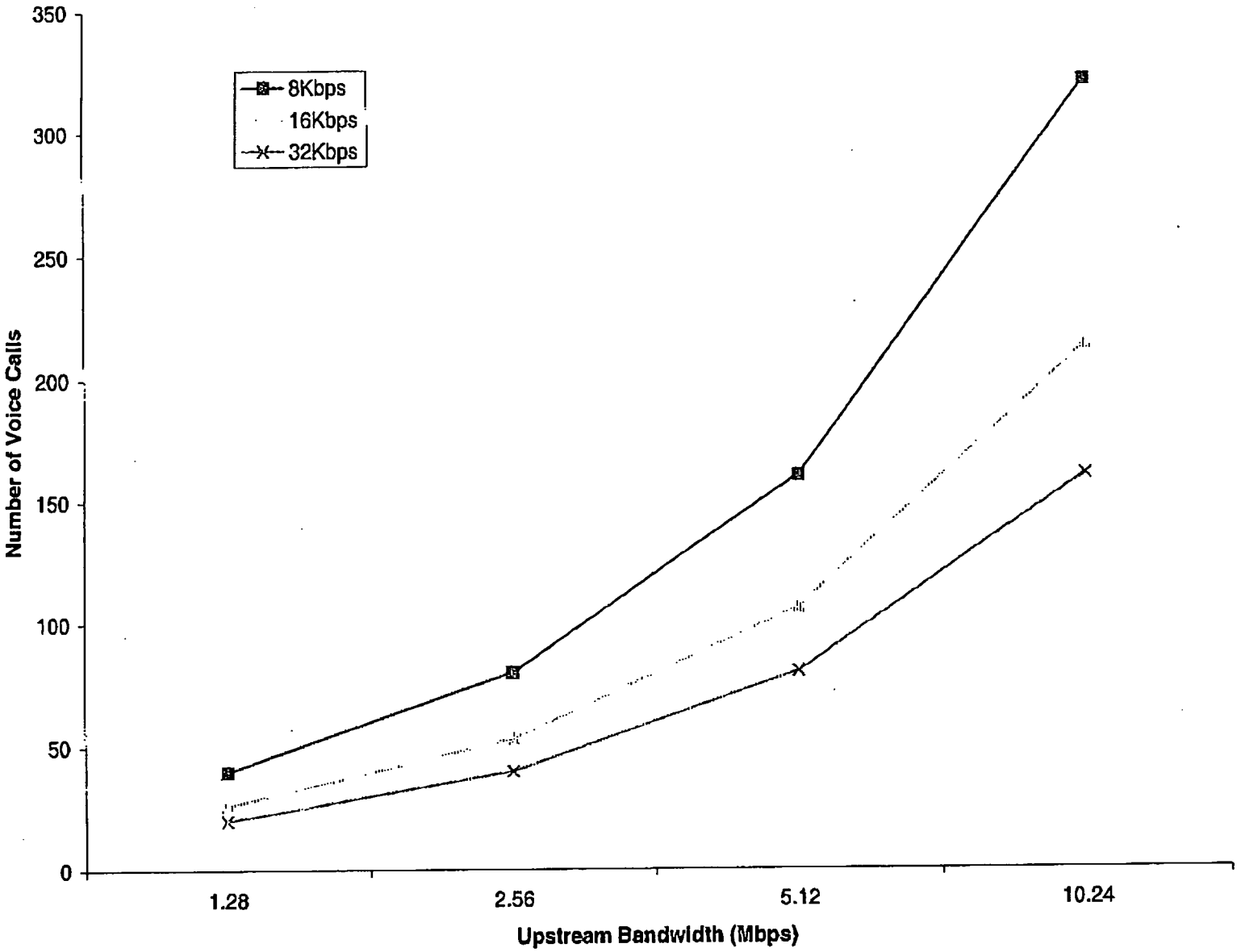

350
300
250
200
150
100
50
0
8Kbps
16Kbps
32Kbps
Number of Voice Calls
1.28
2.56
5.12
10.24
Upstream Bandwidth (Mbps)

FIG. 17

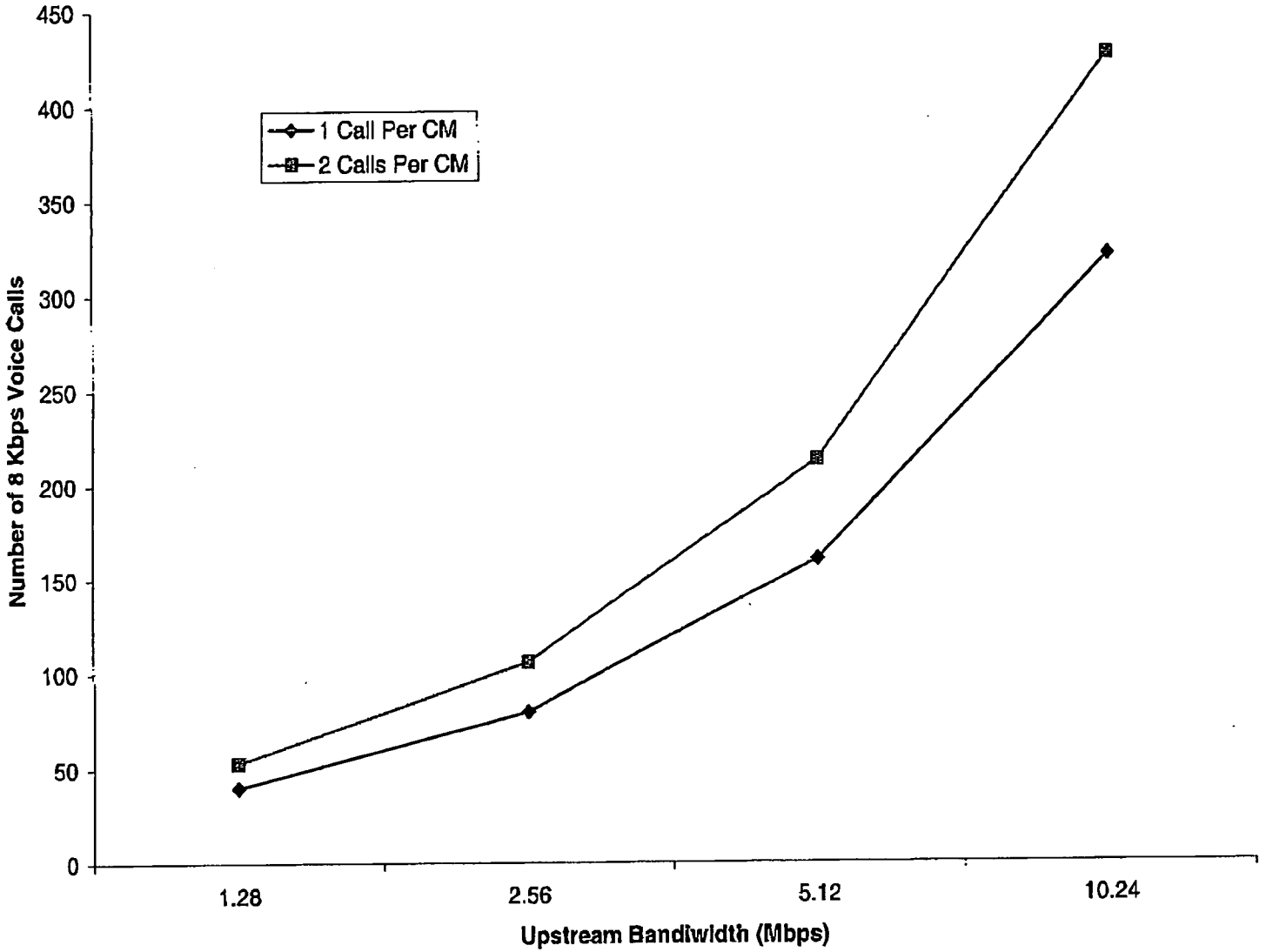

450
400
350
300
250
200
150
100
50
0
1 Call Per CM
2 Calls Per CM
Number of 8 Kbps Voice Calls
1.28
2.56
5.12
10.24
Upstream Bandiwidth (Mbps)

FIG. 18

TOSTA20-020586760

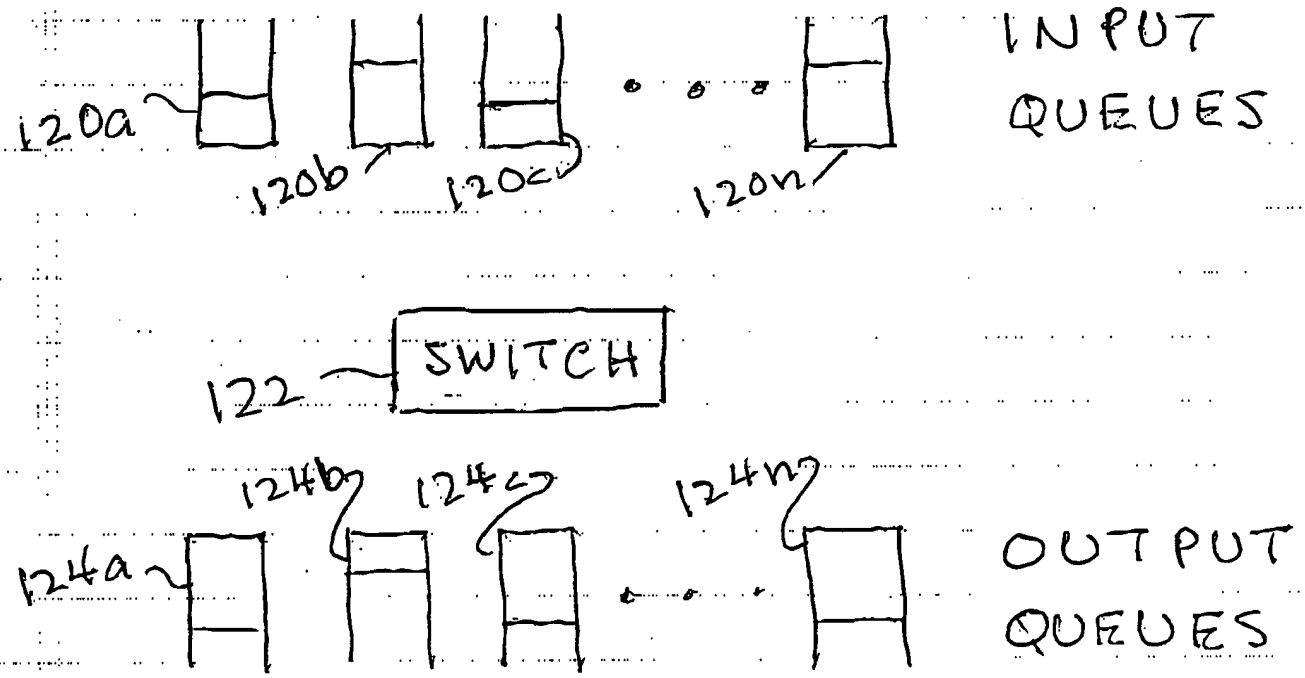


FIG. 19